

#3680
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WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

June 20, 2011

TO: Internal File

THRU: Daron Haddock, Permit Supervisor

FROM: James D. Smith, Environmental Scientist III *DS 06/21/11*

RE: 2010 Fourth Quarter Water Monitoring, Canyon Fuel Company, LLC, Skyline Mine, C0070005, Task ID #3680

The Skyline Mine is an operating longwall mine. Current operations are in the North Lease area of the mine. Many mined-out areas of the mine have been sealed-off. Water monitoring requirements can be found in Section 2 of the MRP, especially pages 2-36, 2-36a, 2-36b, 2-37, 2-38, and 2-39.

For reasons that have not been determined, entry of the Fourth Quarter data into the database encountered numerous problems and data entry was not complete until early June 2011.

CS-2 (stream), WQ36-1 (spring), WC-1 through 9S (wells) were added to the plan in February 2011, but sampling and analysis for these sites were included in the Fourth Quarter data.

1. Were data submitted for all of the MRP required sites? YES ☒ NO ☐

Second, Third, and Fourth Quarter monitoring requires regular information from 86 sites. Additional locations on streams in the North Lease are monitored for one year before, during, and for one year after their being undermined.

Note: Samples are analyzed for tritium at several sites, plus deuterium, carbon-14, and oxygen-18 at JC-1. Because determinations of isotopic concentrations can require several months, these values are often reported later than those from field measurements and routine laboratory analyses. The Permittee has always been prompt at getting the isotopic data to the Division as soon as they are received from the lab.

In-mine

The MRP requires sampling at 6 sites categorized as "other" or "in-mine, roof drippers" for all four quarters; however, all 6 are monitored at the surface: *CS-12*, *CS-14*, *MD-1*, and *SRD-1* are mine discharge stations; *CS-13* is a French drain; and *ELD-1* is the combined output of JC-1 and JC-3. The Permittee submitted all required information for these sites for the Fourth

Quarter 2010.

Springs

No springs are monitored during the First Quarter, but 27 springs are monitored during the Second, Third, and Fourth Quarters: *S10-1, S12-1, S13-2, S13-7, S14-4, S15-3, S17-2, S22-5, S22-11, S23-4, S24-1, S24-12, S26-13, S34-12, S35-8, S36-12, 2-413, 3-290, 8-253, WQ1-1, WQ1-39, WQ3-6, WQ3-26, WQ3-41, WQ3-43, WQ4-12, and WQ36-1*. Except for tritium values at S24-1 (See Note above), the Permittee submitted all required information for the springs for the Fourth Quarter 2010.

Streams

The MRP requires First Quarter sampling at only 4 stream-sites: *CS-6, VC-6, VC-9, and VC-10*, but at 30 sites during the Second, Third, and Fourth Quarters: *CS-3, CS-6, CS-7, CS-8, CS-9, CS-10, CS-11, CS-16, CS-17, CS-18, CS-19, CS-20, CS-21, CS-22, CS-23, CS-24, CS-25, F-10, UPL-10, VC-6, VC-9, VC-10, VC-11, VC-12, WRDS-1, WRDS-2, WRDS-3, WRDS-4, EL-1, and EL-2*. The parameters measured at each site vary: see Table 2.3.7-1. The Permittee submitted all required information for these stream sites for the Fourth Quarter 2010.

The Permittee monitors additional stream sites in the North Lease (designated as NL-1 through NL-42) monthly for 12 months before, during, and 12 months after their being undermined by the longwall. Monitoring results are reported in the Annual Hydrologic Report (Sec. 2.4.4) and submitted to the database. The Permittee commits to measuring the flow monthly in June through October, and measuring flow during other months if the sites are accessible. Twelve NL sites were monitored during the Fourth Quarter 2010.

Wells

Water levels are measured at 26 wells during the Second, Third, and Fourth Quarters: *8-5-1, W79-10-1B, W79-14-2A, W79-26-1, W79-35-1A, W79-35-1B, W2-1, W20-4-1, W20-4-2, W99-4-1, W99-21-1, W20-28-1, 91-26-1, W91-35-1, 92-91-03, WC-1, WC-3N, WC-3S, WC-5N, WC-5S, WC-7N, WC-7S, WC-9N, WC-9S*. Operational parameters are also measured at 92-91-03. None of these wells are monitored during the First Quarter.

Monthly flow measurements are required year round at *JC-1* and *JC-3*. During the Second, Third, and Fourth Quarters, the Permittee also measures all field parameters, TDS, TSS, and Total Phosphorous at both sites once per quarter, plus isotopes ¹⁴C, Tritium, Deuterium, and ¹⁸O at *JC-1* once per quarter.

ELD-1 is reported with the "other" or "in-mine, roof drippers" sites.

Well *JC-3* is permitted as a UPDES point by PacifiCorp. That permit requires PacifiCorp to report flow, oil & grease, TDS, NH₃, N as nitrate + nitrite, plus total and dissolved As, Cd, Cr, Cu, Fe, Pb, Hg, Ni, Se, Ag, Zn, and P. Since July 2004, *JC-3* has discharged only once, in October 2007.

Except for isotopic data at JC-1 (See Note above), the Permittee submitted all required information for the well sites for the Fourth Quarter 2010.

UPDES

The UPDES Permit and MRP require weekly monitoring of 3 outfalls: 001, *Sedimentation Pond Discharge to Eccles Creek at the Portal*; 002, *Sedimentation Pond Discharge to Eccles Creek at the Loadout*; and 003, *the Sedimentation Discharge at the Waste Rock Disposal Site*. DMR parameters (total Fe, TDS, pH, TSS, flow, oil and grease, and specific conductivity, and temperature) are reported to the database as operational parameters. Total Fe is analyzed twice per month rather than weekly. Parameters that are not included in the operational parameter lists in the MRP - such as sanitary wastes, visible foam, and floating solids - are not reported in the electronic submittal to the Division.

Well JC-3 is permitted as a UPDES point by PacifiCorp. For JC-3, Skyline reports only monthly flow during the First Quarter, and monthly flow and quarterly field parameters, TDS, TSS, and T-P during the Second, Third, and Fourth Quarters. (The UPDES permit for JC-3 requires PacifiCorp to report flow, oil & grease, TDS, NH₃, N as nitrate + nitrite, plus total and dissolved As, Cd, Cr, Cu, Fe, Pb, Hg, Ni, Se, Ag, Zn, and P.) Since July 2004, JC-3 has discharged only once, in October 2007.

The Permittee submitted all required information for the UPDES sites for the Fourth Quarter. Outfall 001 flowed throughout the quarter, Outfall 002 flowed during the week of December 20, and Outfall 003 reported no flow during the entire quarter.

2. Were all required parameters reported for each site? YES ☐ NO ☒

Water from JC-1 is analyzed once per quarter for field parameters, TDS, TSS, T-P, ¹⁴C, Tritium, Deuterium, and ¹⁸O. The Permittee usually has these analyses done during the 3rd month of the quarter, but because the pump was not operating during November and December, these parameters were missed during the Fourth Quarter 2010.

3. Were any irregularities found in the data? YES ☒ NO ☐

Listed parameters were more than two standard deviations from the mean. Parameters in bold typeface were also more than two standard deviations from the mean during the last quarter when monitoring was done. Underlined and bolded parameters have been more than two standard deviations from the mean during two or more consecutive monitoring events. An asterisk indicates the parameter is not required.

As shown in the following table, many sites had cation-anion balances that were outside two standard deviations from the mean; however, except for CS-8 (6.1%), CS-9 (11%), cation-anion balances were within 5% for the samples that were analyzed for the appropriate ions.

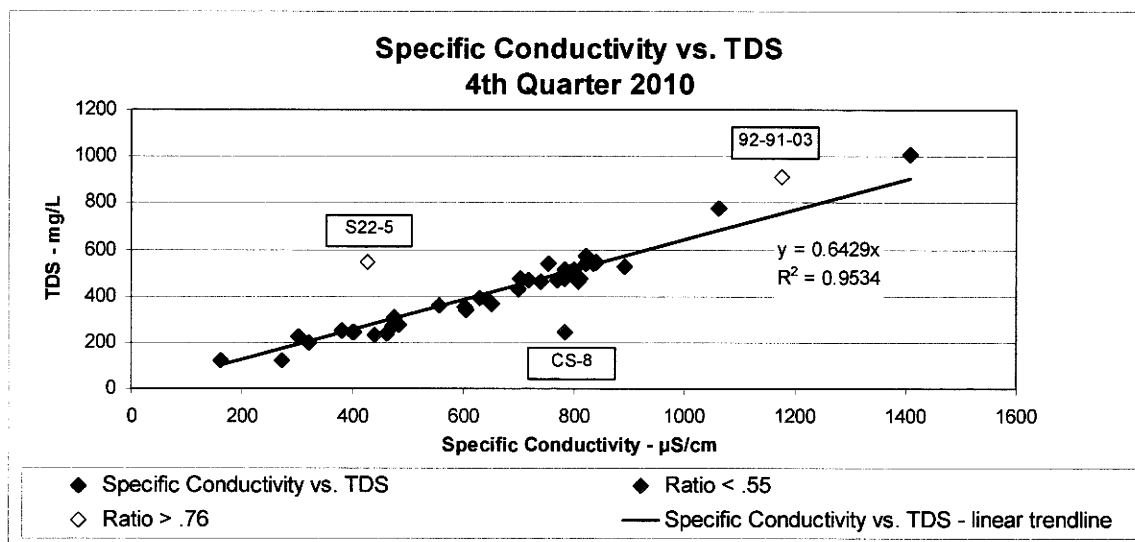
Site Name	Type	Parameters
CS-14	Other	Bicarbonate as CaCO ₃
CS-3	Stream	TDS, field electric conductivity, Cl
CS-6	Stream	Bicarbonate as CaCO₃
CS-8	Stream	Cation - anion balance , field electric conductivity
CS-9	Stream	Total alkalinity, cation - anion balance
CS-11	Stream	Bicarbonate as CaCO ₃ , T-Ca*
CS-17	Stream	Cation - anion balance*
CS-19	Stream	Bicarbonate as CaCO ₃ , cation - anion balance
CS-20	Stream	Total alkalinity, bicarbonate as CaCO ₃ , D-K
F-10	Stream	Field electric conductivity
UPL-10	Stream	Cation - anion balance
VC-6	Stream	bicarbonate as CaCO₃
VC-9	Stream	bicarbonate as CaCO₃
UT0023540-002	UPDES	Flow (20 December)
S10-1	Spring	TSS
S17-2	Spring	total hardness, bicarbonate as CaCO₃
S22-5	Spring	Flow, field pH, TDS
WQ1-39	Spring	Bicarbonate as CaCO₃ , cation - anion balance
WQ3-6	Spring	TSS, total hardness, TDS, bicarbonate as CaCO₃
WQ3-26	Spring	D-K
WQ3-41	Spring	Bicarbonate as CaCO₃ , Na
WQ3-43	Spring	Total hardness, bicarbonate as CaCO₃
WQ4-12	Spring	Cation - anion balance, SO ₄ , bicarbonate as CaCO₃
W79-10-1b	Well	Depth
W20-4-2	Well	Depth (probe stuck)
92-91-03	Well	TSS, cation - anion balance, bicarbonate as CaCO₃

The Division calculated the following Reliability Checks, based on previous Water Quality Reports for the Skyline Mine (for further information on Reliability Checks, see Chapter 4, *Water Quality Data: Analysis and Interpretation* by Arthur W. Hounslow.)

When these Reliability Checks do not meet the target value, it does not necessarily mean that the analyses are in error; however, it does indicate the collection and analysis procedures might benefit from some extra scrutiny by the Permittee. The Permittee should work with the lab to make sure that samples pass all quality checks so that the reliability of the samples does not come into question. However, the consistent results of these reliability checks from quarter to quarter probably indicates that local conditions do not match those upon which these Reliability Checks were formulated.

Kevin Lundmark of the Division made a study of several of these reliability checks and recommended that, for Wasatch Plateau coal mines, published acceptability criteria seem appropriate for all except Mg/Ca+Mg*. The most likely reason that published acceptability criteria may not be applicable for Wasatch Plateau water-quality data review is that the underlying geologic assumptions may not be appropriate for the regional geologic conditions.

- TDS/Conductivity
 - Out of 43 samples for which both field specific-conductivity and TDS were determined, 37 have a TDS/Conductivity ratio in the expected range between 0.55 and 0.76.
 - 92-91-3 is just outside the expected range at 0.77, which is similar to the 3rd Quarter result (0.78) for this site.
 - The highest ratio is 1.28 at S22-5: the TDS value is low at this site and more than 2 standard deviations from the mean.
 - The lowest ratio is 0.31 at CS-8: the Specific Conductivity value at this site is high and more than 2 standard deviations from the mean. .
 - The linear trendline has a slope of 0.64 (see chart).



- For 29 samples, the Division calculated Reliability Checks that involve dissolved Ca, Mg, K, Na, Cl, and SO₄. There were not sufficient dissolved-ion data at other sites to perform these checks.
 - **K/(K+ Na) ratio**
 - The K/(K+ Na) ratio should be ≤20%.
 - For 17 of 29 samples, the ratio is >21%.
 - At the other sites, the ratio ranges from 2 to 17%.
 - These values are consistent with previous results for the Skyline Mine.

- **Mg/(Ca + Mg) ratio (*See Kevin Lundmarks remark above.)**
 - Ideally the Mg/(Ca + Mg) ratio is $\leq 40\%$.
 - All 29 samples have ratios $\leq 40\%$.
 - The CS-12 ratio is 39%; CS-12 frequently has the highest ratio, very close to 40%.
 - These results are consistent with previous results for the Skyline Mine.
- **Ca/(Ca + SO4) ratio**
 - Ideally the Ca/(Ca + SO4) ratio is $\geq 50\%$.
 - Of the 29 samples, 7 have a Ca/(Ca + SO4) ratio $< 50\%$.
 - The lowest ratio is 16%.
 - Because Mg/(Ca + Mg) values are within the expected range, SO4 values may bear watching; however, these results are consistent with previous results for the Skyline Mine
- **Na/(Na + Cl) ratio**
 - The Na/(Na + Cl) ratio should be $\geq 50\%$.
 - The ratio ranges from 6% to 49% at 18 of the 27 sites.
 - These are the very similar to the results from previous quarters at the Skyline Mine.

UPDES

UPDES permit UT0023540 (effective December 1, 2009) allows for a DML for TDS of 1,200 mg/L and a 30-day average of 500 mg/L. There is no tons/day DML unless the 30-day average exceeds 500 mg/l; then a 7.1 tons/day limit is imposed. For the Fourth Quarter of 2010, the discharge at Outfall 001 did not exceed the DML for TDS of 1,200 mg/L; however, the average for the Fourth Quarter was 504 mg/L (368 to 570 mg/L) and the tons/day load (calculated from the weekly values for TDS and flow in the database) during the Fourth Quarter averaged over 12 tons/day, ranging from 8.8 to 19.4 tons/day. Because of ongoing exceedences, particularly at outfall 001, Canyon Fuel Company participates in the Salinity Offset Plan that was approved by DWQ on January 5, 2005 (retroactive to September 2004).

The discharge event at outfall 002 in late December was below the 1,200 mg/L and 30-day limits.

4. On what date does the MRP require a five-year re-sampling of baseline water data.

Beginning in 2010 and every five years thereafter, baseline analyses are to be done on samples collected during the Third Quarter (MRP p. 2-44). This was done during the Third Quarter 2010, except acidity analysis was missed in the Third Quarter and done during the Fourth Quarter.

5. Based on your review, what further actions, if any, do you recommend?

The Division has no recommendation for further action for Fourth Quarter 2010 water quality sampling and analysis.

6. Does the Mine Operator need to submit more information to fulfill this quarter's monitoring requirements? YES ☐ NO ☒

The pump in JC-1 was not operating in December 2010 when the field parameters normally would have been measured and samples for ^{14}C , tritium, deuterium, ^{18}O collected, so the Fourth Quarter measurements and analyses at JC-1 were missed.

7. Follow-up from last quarter, if necessary.

Due to a lab error, acidity was not analyzed during the Third Quarter 2010 for the five-year baseline re-sampling. The Permittee had analysis done for acidity during the Fourth Quarter 2010.

All isotope data for the First and Second Quarters 2010 have been uploaded to the database.

8. Did the Mine Operator submit all missing and/or irregular data?

The Permittee was able to provide all the required data, including acidity data missing from the Third Quarter baseline analyses.